RipStream Review

18 April 2011

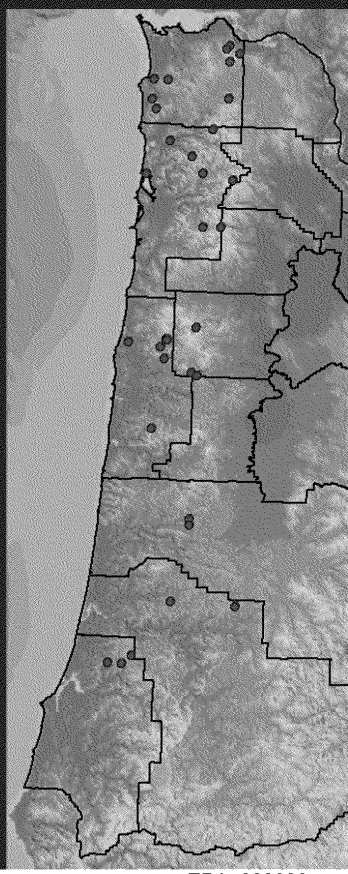
RipStream – Riparian Function and Stream Temperature

Origins and Extent

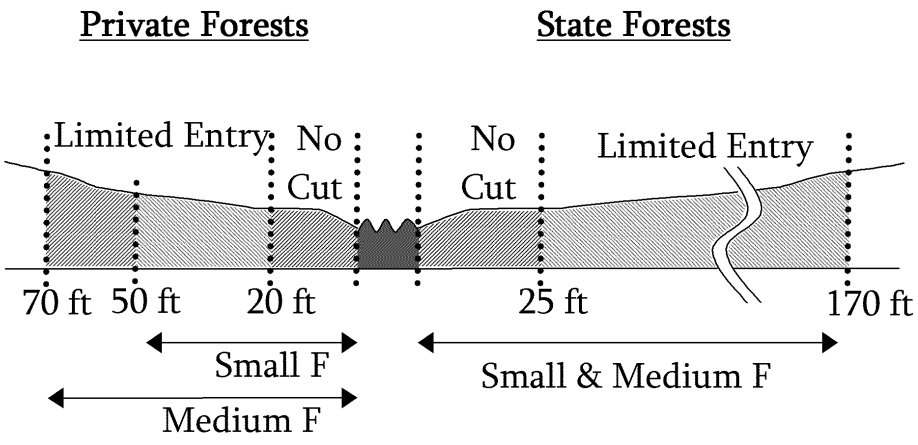
State and Private Forests joint effort

- Objective: Evaluate effectiveness of forest practices rules & strategies at protecting stream temperature, promoting riparian structure

- 33 Sites (18 Private, 15 State, Medium and Small F)



Rules and Strategies

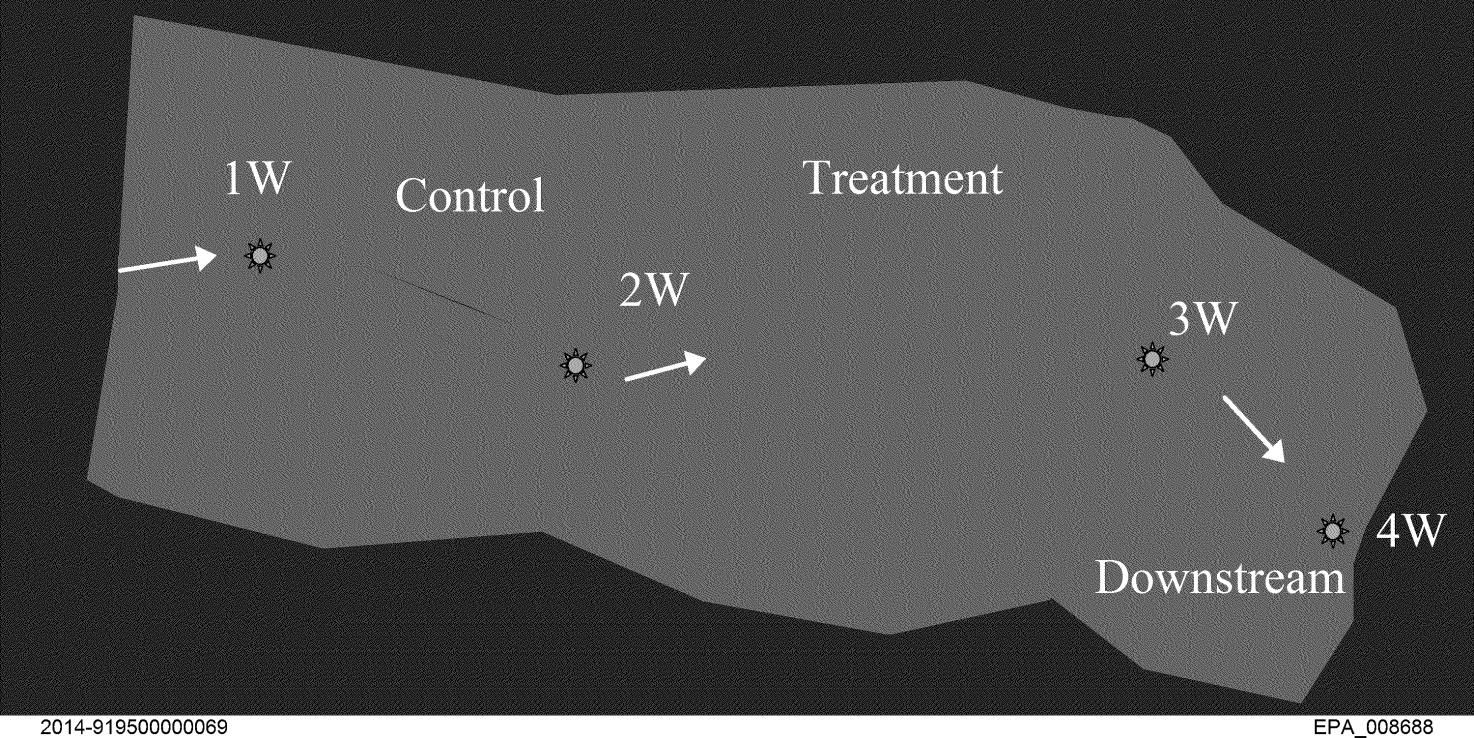


Private: Forest Practices Act

State: Northwest Oregon State Forest Management Plan

RipStream Study Design

Design: 2 years pre-harvest, 5 years post harvest



RipStream – Data

Seven years of data collection

- Stream temperature

  Almost 3 million hourly data points

- Shade

  Pre-harvest, post1, post 3, post 5

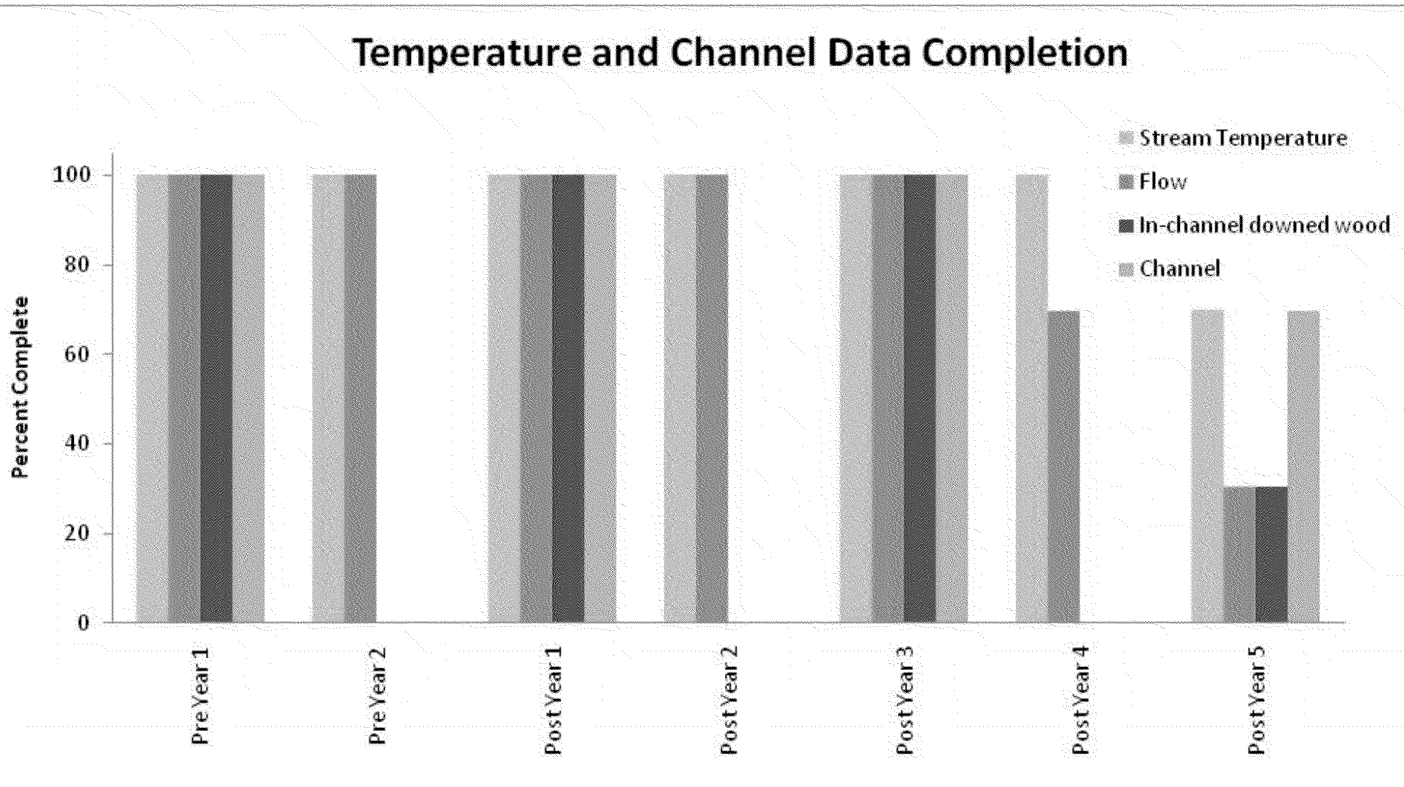
- Channel morphology: gradient, width, etc.

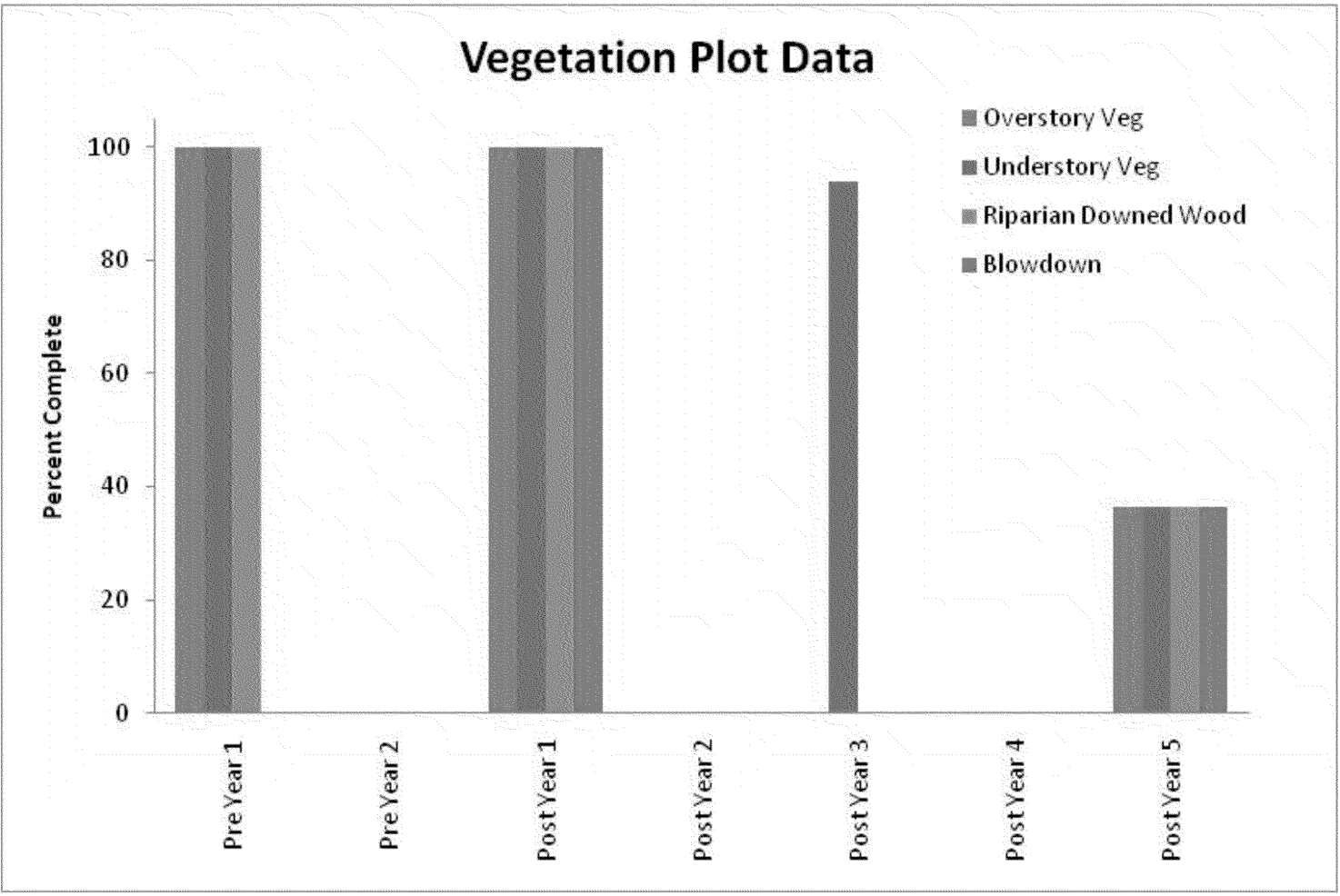
- In-channel wood volume

- Riparian vegetation: wood, shrubs, overstory

Data Collection Schedule

	Pre-harvest			Post-harvest				
	YR -2	YR -1	HARVEST	YR1	YR2	YR3	YR4	YR5
Data Collected								
Stream Temperature	X	X	HARVEST	X	X	X	X	X
Stream Flow	X	X		X	X	X	X	X
In-Channel Downwood	X			X		X		X
Shade / Channel	X			X		X		X
Overstory Vegetation	X			X				X
Understory Vegetation	X			X		X		X
Downwood	X			X				X
Blowdown				X				X


Temperature and Channel Data Completion
Stream Temperature
Flow
In-channel downed wood
Channel
Percent Complete
100
80
60
40
20
0
Pre Year 1
Pre Year 2
Post Year 1
Post Year 2
Post Year 3
Post Year 4
Post Year 5


Vegetation Plot Data
Overstory Veg
Understory Veg
Riparian Downed Wood
Blowdown
Percent Complete
100
80
60
40
20
0
Pre Year 1
Pre Year 2
Post Year 1
Post Year 2
Post Year 3
Post Year 4
Post Year 5

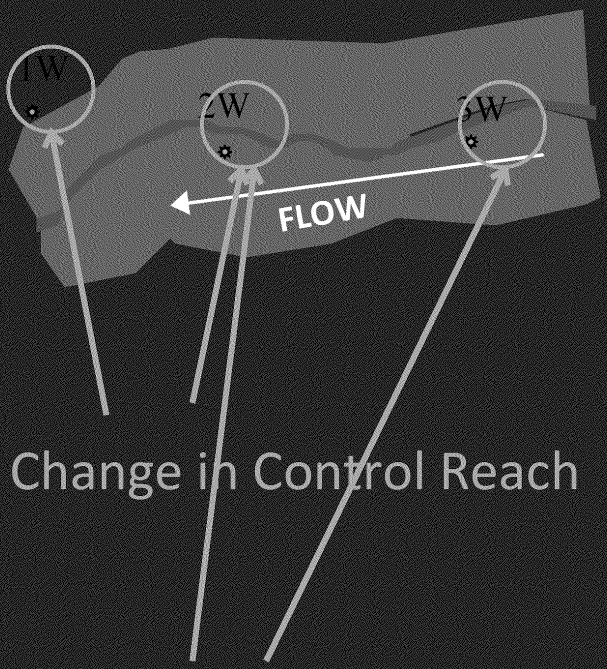
Current Objectives

- Determine stream temperature change out to 5 years post-harvest
- Identify relationship between stream temperature change and stream variables including shade
- Quantify relationship between stream shade and riparian stand characteristics
- Provide all data and metadata in a usable, useful format

What are we quantifying?

- Changes in temperature (downstream – upstream)
- Averaged daily values

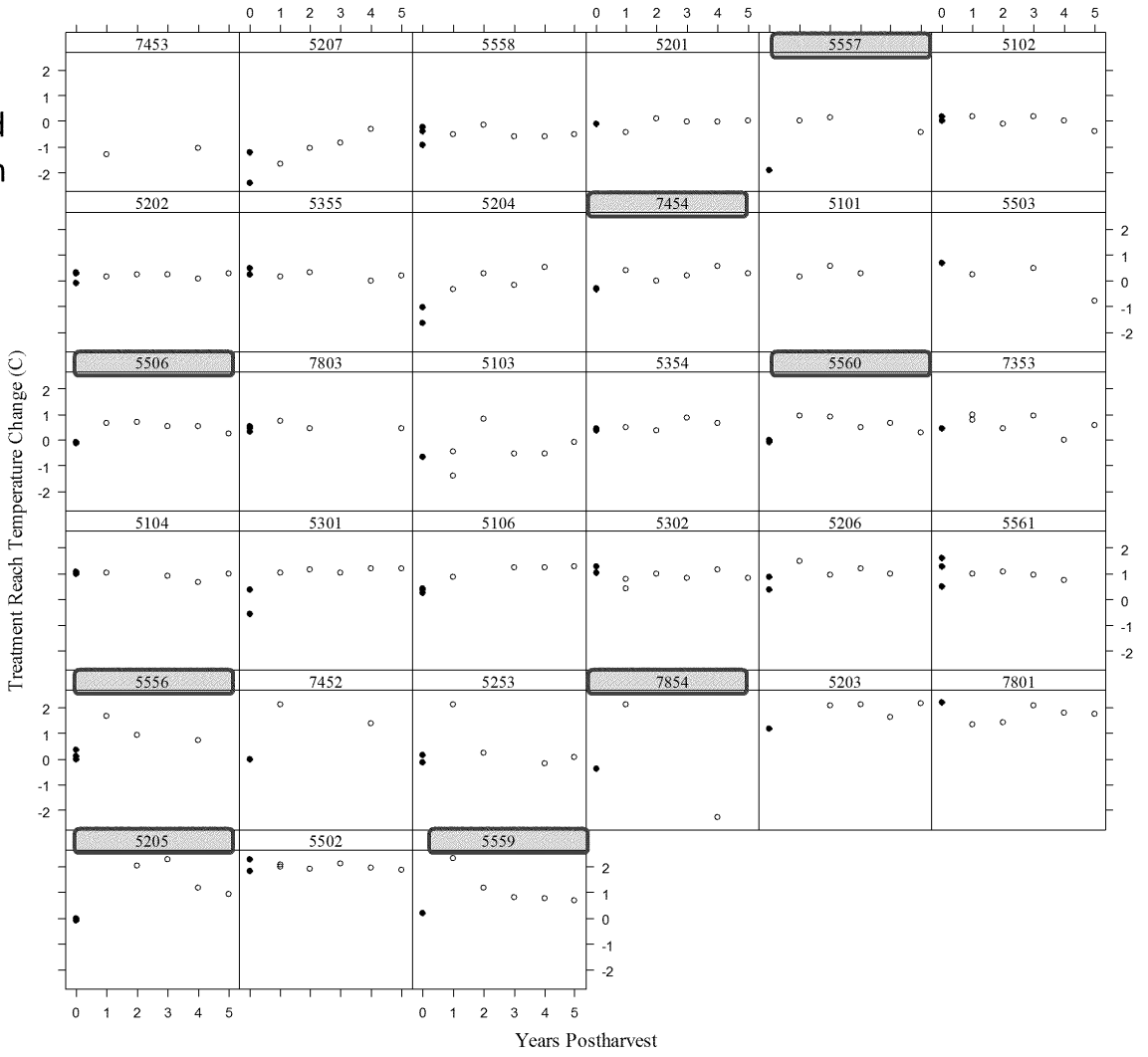
  (July 15 – Aug 23)
  - Maximum
  - Minimum
  - Average
  - Diel Fluctuation



2W-1W = Change in Control Reach

3W-2W = Change in Treatment Reach

All Summarized Daily Maximum Temperature Data



Analysis Approach

1) Determine appropriate statistical analysis

   Linear mixed-effects regression

2) Develop competing explanations (models) of how temperature change controlled

   Select best-supported model or models, ranked AIC

3) Examine model results

Models Examined

- Upstream: Treatment reach temperature change (TR) depends on the upstream control temperature.
- Upstream_TRlength:TR depends on the upstream control temperature and the treatment reach length.
- Postharvest Constant (PostConst): Same as Upstream_Trlength but additionally includes indicator variable for timing (pre or post). This model assumes that post-harvest changes are permanent.
- Postharvest Sequential (PostSeq): Same as PostConst but allows a change (linear) in post-harvest response over time.
- Postharvest Constant Private (PostConstP): Same as PostConst but includes an interaction between ownership and timing to highlight data that come from private sites post-harvest. This model assumes that post-harvest changes are permanent.
- Postharvest Sequential Private (PostSeqP): Same as PostConstP but allows a change (linear) in post-harvest response over time.
- Beyond Optimal (BO): Same as PostSeq but additionally includes elevation, watershed area, and ownership (Private, State).

Model Performance

	df	AIC	BIC	deltaAIC	ω
PostSeqP	9	343.404	373.178	0.000	0.708
PostConstP	8	345.215	371.681	1.811	0.286
PostSeq	9	353.565	383.339	10.161	0.004
BO	12	356.278	395.977	12.874	0.001
PostConst	8	358.718	385.184	15.314	0.000
upstream_TRlength	7	374.788	397.946	31.384	0.000
upstream	6	379.989	399.838	36.585	0.000
intercept	5	386.258	402.799	42.854	0.000

Initial Findings – Fixed Effects

	Value	Std.Error	DF	t-value	p-value
(Intercept)	0.316	0.127	166	2.48	0.014
ControlTemp	-1.171	0.328	166	-3.57	0.001
PrivPost	0.648	0.106	166	6.14	0.000
TReachLength	0.744	0.283	31	2.63	0.013
YrsPost	-0.041	0.021	166	-1.97	0.050

Meeting Grant Expectations

- Data compilation
  - Temperature = done
  - Shade, channel, in-channel wood = nearing completion
  - Vegetation plot data = complete
- Flesh out temperature analysis
- Conduct shade analysis similar to earlier work
- Summarize methods and findings in a report
- Submit databases & documentation